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FOUNDRY TRADE JOURNAL
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Vol. 69 Thursday, March 25, 1943 No. 1388

The Next Step?

Now that the concentration scheme in the ironfoundry industry is at an end, it is possible for an examination to be made of what was brought to light. The first feature was the extraordinary variation in price charged by the different foundries, especially for the lighter variety of castings for the engineering trades. As a result there is bound to be a demand in the future for a more intelligent attack on the establishment of selling prices for jobbing castings. In this connection it is interesting to learn that the Association of Bronze and Brass Founders, the Meehanite Institute and other bodies are now actively engaged on this question.

Another factor brought to light is that moulding floor area and melting capacity taken together do not give a reliable index for potential production. It was quickly realised when the work of three foundries was concentrated under one roof, core-making facilities were in some cases totally inadequate and a bad bottle-neck occurred. As time passed, the service departments became aware of the indispensable character of the jobbing foundry as part and parcel of the over-all maintenance system of industry in general. Finally, there was a realisation that before a job can be put into production, the early experimental work has to be carried out on a jobbing floor, be it a corner of a large concern or a small independent concern. Gratitude is felt amongst the smaller companies for the successful efforts made on their behalf by the C.F.A., but they are somewhat bewildered at the amazing array of employers' associations and seem to favour the concept of one big overriding confederation, which would be stepped down regionally and vocationally so as to ensure that the fourth largest industry in the country could permanently ensure adequate representation in matters affecting its general welfare, much on the lines suggested by Mr. V. Jobson in his speech as chairman of the Ironfounders' National Confederation. This may be a little premature, for, as we forecast many years ago, it has required a period of intense crisis to create a consciousness amongst owners that a foundry industry really exists. This realisation is urging some people to run before they can walk. Great progress has been made and the Board of Trade's concentration scheme, though it only affected ironfounding, did result in focussing the attention of the whole of the industry upon the need for creating organisations capable of interpreting the impact of proposed Government legislation. Co-operative action has so far tackled questions in addition to concentration, such as reserved occupations, clothing coupons for workers, and fuel economy, yet in the near future, the industry may be called upon to face up to a far-reaching proposition involving the economic life of every foundry, be it iron, steel or non-ferrous, in the country.

Evaluating the Characteristics of Furnace Coke

In an analysis of fundamental considerations relating to the improvement of the properties of blast furnace coke on the basis of recent research and experience, H. HOFFMANN in "Stahl und Eisen" of October 1 last reports that experimental work over many years on the behaviour of coals in the plastic state indicates that it is possible to evaluate the constitution and nature of a furnace coke from a simple, accurate and reliable method of examination of the initial coal. Apart from certain purely technical factors, such as the bulk density of the coal, and the temperature and rate of carbonisation, the structure of the resulting coke is largely determined by the properties of the coal or coal mixture when in the plastic state, suggests the author, who states that a report of the work done in this direction and of the procedure recommended will shortly be published.

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CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

LEAD BRONZES

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—The following letter received from a leading manufacturer of lead bronzes in connection with their production to B.S. Specification 962/3 raises points of considerable interest to the industry, and the Non-Ferrous Sub-Committee of the Technical Committee feel that founders throughout the country interested in the production of leaded alloys may have some information or opinion on this matter which would be useful in considering the problem.

Will any non-ferrous founders interested in this matter kindly submit their remarks to the Editor of this journal or alternatively to the Acting Secretary, Institute of British Foundrymen?—Yours, etc.,

JOHN BOLTON,
Acting Secretary.

Institute of British Foundrymen.

SIR,—As you are aware, there are now British Standard Specifications covering various lead bronzes, of which we are manufacturers on a large scale. With regard to B.S. Specification 962/3 for 80/10/0/10 leaded bronze, we shall be glad if you can give us some information as to the general practice of the members regarding the question of ventilation.

We feel that this matter is one of major importance to the industry at the present moment as, owing to the introduction of wartime specifications such as B.S.S. 897/8 for 85/5/5/5 leaded gunmetal, metals are now being melted in the general foundry which contains an appreciable proportion of lead. In the case of the true copper leads, which may contain up to 30 per cent. lead, it is, of course, established that very special precautions must be taken regarding exhausting of lead fumes and ventilation, but it appears to us that the case of B.S.S. 962/3 material is a borderline item, thus, the 85/5/5/5 material is undoubtedly dealt with in the ordinary foundry under exactly the same conditions as the straight gunmetal and phosphor bronze, and we feel that it would be wise to obtain a consensus of opinion in the industry as to whether the 80/10/0/10 material can be similarly treated.

It will be appreciated that in the case of copper lead, not only must the exhausting ventilation precautions be taken, but during pouring the men must wear gas masks and must take every precaution to avoid lead poisoning, but this does not apply to the 85/5/5/5 material. We ourselves feel that 80/10/0/10 can safely be handled in the same manner as the 85/5/5/5 material, but obviously a stage must be reached somewhere at which the special precautions become necessary. For example, in the case of B.S.S. 864/5 material containing 15 per cent. of lead, we should feel that special precautions were necessary, and in the manufacture of our own proprietary lead bronze which contains 20 per cent. of lead, this again is dealt with under conditions of special ventilation.

It is most important, however, from a production point of view to obtain some ruling or indication of general practice in the case of the 10 per cent. lead material. In our own particular works, production is greatly facilitated if this material can be dealt with in the general foundry which, of course, has the normal ventilation system of any bronze foundry, whereas, if this production must be removed to the special lead bronze foundry, capacity becomes limited and considerable structural alterations may be entailed.

We feel that this matter is of such general importance to the industry at the present time that we shall be grateful if you can either raise the matter at an Institute meeting or, better still, can obtain, by means of a questionnaire or any other means you feel desirable, some indication of the general practice of members of the Institute. As the matter is of some urgency, we shall be greatly obliged if you could let us have an early indication.—Yours, etc.,

"P. B. BRONSE."

London.
March 11, 1943.

NOTES FROM THE BRANCHES

London.—More than a hundred members and guests last Saturday participated in a meeting held in the lecture theatre part of the research department of High Duty Alloys, Limited, Slough, when Mr. E. W. Harding presented, by courtesy of the International Meehanite Metal Company, Limited, a Paper, illustrated by a coloured film and lantern slides, covering the subjects of gating, runners and risers. Mr. V. C. Faulkner, past-president of the Institute, presided. Time considerations unfortunately restricted the discussion to a contribution by Mr. Ross, of High Duty Alloys. Mr. Logan proposed and Mr. B. B. Kent supported a vote of thanks to the lecturer. Mr. J. F. Kayser and Mr. Cherry Paterson voiced the thanks of the meeting to Col. Devereux and staff of High Duty Alloys for the hospitality accorded to the members. After tea had been served, an inspection of the magnificently equipped research laboratories concluded the proceedings.

As there is to be a meeting of the Council in the near future, will all applicants for membership please forward their forms to the honorary secretary as soon as possible?

Die-Casting Film.—The history, method of production and use of die castings, are presented in a three-reel colour motion picture of 35 mins. duration, produced by New Jersey Zinc Company, New York. Castings produced from zinc-base, aluminium-base and magnesium-base alloys are reviewed in the film, and an accompanying 148-pp. book, "Die Casting for Engineers." Book and the picture describe the alloys now used, elements of die construction, specifications, inspections and tests, methods and tools for flash removal machining practice, jigs and fixtures for machining die castings, finishes, and designs for castings.

FOUNDRY TECHNIQUE IN RELATION TO CERTAIN PRESSURE CASTINGS

Describing the production of characteristic types of castings from the practical standpoint

By F. DUNLEAVY

(Continued from page 221)

High-Pressure Boiler Feed Pump

Fig. 14 shows the top and bottom half mould, complete with a set of cores for a bottom half casing for a boiler feed pump originally made as a steel casting. The metal thickness of this casting varies from 1¼ to 5½ in. This drastic variation of section must be taken care of, in view of the fact that neglect of this attention will cause endless trouble when the casting is subjected to hydraulic test of 1,000 lbs. per sq. in. The metal used is a high-duty cast iron giving 17 to 18 tons tensile. A typical analysis is as follows:—T.C, 3.1 to 3.2; Si, 1.1 to 1.3; Mn, 0.7 to 0.8; S, 0.10; and P, 0.3 per cent.

Two down-runners were used, 2 in. dia. each, and one inlet from each runner. These are shown in this

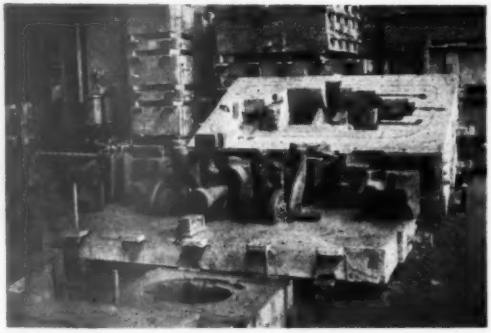


FIG. 14.—CORE AND MOULD FOR BOTTOM HALF OF HIGH-PRESSURE BOILER FEED PUMP.

view. All the cores for this type of pump are still made in loam in order to make absolutely sure that there is no fusion of metal and core. Any defect of this nature in the waterway would affect the efficiency of the pump and cause the casting to be rejected. The drawback cores for the top half of this mould are all tied back to make certain the correct thicknesses are maintained and that the cores are not moved out of position when the top part is turned over. The main cores in the bottom half mould are also tied through the mould.

Fig. 15 shows the pump body for this 6-stage pump and illustrates the position of the six impeller ways. The duties of a boiler feed pump of this type are very arduous. This particular one will pump water at the rate of 613 galls. per min. against 1,310-ft. head and works at almost 3,000 r.p.m.

Fig. 16 and Fig. 17 show the outside view of this casting from two different angles. The casting is 5 ft. 6 in. long, 3 ft. wide, 18 in. deep, and 40 chills were incorporated into the whole assembly, 21 on the mould, 19 in the core. A close inspection of this view will convince all that the chills were essential. Ten risers were used; the position of most of these can still be seen. The dressed weight of this casting was approximately one ton.

Gunmetal Evaporator Body

Although there is nothing very unusual about the moulding of the casting shown in Fig. 18, the

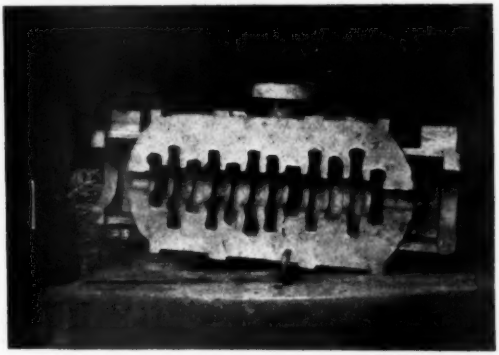


FIG. 15.—BOTTOM HALF OF BODY CASTING FOR 6-STAGE PUMP.

method of running is of interest as the job is over 3 ft. deep and only $\frac{5}{16}$ in. metal thickness in the main. It was made in a three-parted moulding box and two joints were used to enable the mould to be run at the bottom as well as at the top. A later view shows that two down runners were used with a stepped joint. These were 2½ in. square; each one supplied three ingates 4 in. wide by ¾ in. deep, plus two ingates the same size from each down runner on the top joint.

A dried runner box was used, the inside dimensions of which were 5 ft. 6 in. long by 1 ft. wide by 9 in. deep. This may appear to be excessively large, but it proved no more than adequate to maintain a head of metal in the runner box, which is necessary in

Founding of Pressure Castings

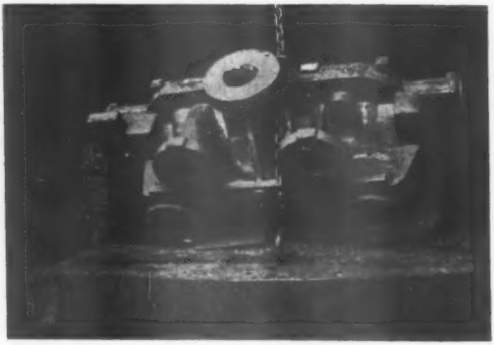
order to exclude any foreign matter. The importance of cleanliness will be appreciated when it is remembered that the main body of the casting was only $\frac{5}{16}$ in. thick. Risers were used on the small top flanges and to avoid the possibility of air locks, a row of whistlers was arranged around the top of the casting and from external ribs. The centre of the top part moulding box was left open to enable the moulder to fill in with ashes, etc., after closing.

The complete set of cores was made in oil sand: the body core was made in halves with a grid in each half. There was a 3 in. clearance all round the grids with ample strawband used next to the grids and particularly in the rectangular box portion. This may perhaps be considered an unnecessary precaution, but the grids had to be broken through after casting to ensure that nothing was left undone that could assist the contraction.

The centre of each half of the body core was made up of clinkers and rough ashes, leaving a minimum wall thickness of 6 in. of sand. One riser, 1½ in. by ⅜ in., was cut on the centre joint of the half body core to be used as a large vent from the bottom face, thus eliminating any possibility of air locks. This vent or riser was actually connected to the main vents from each half core on the top joint. It might be thought that the metal would have found its way into the main vents, but this never did happen. The greatest length of metal to be found in this vent or riser was 8 in. Some eating in of the metal into the lower portion of the steam way core and the small cores was experienced in the earlier castings. This trouble was eliminated with the application of a proprietary dressing on these cores.

It will be appreciated that the coring-up of this mould demands the greatest degree of accuracy, for $\frac{5}{16}$ in. thickness of metal and a depth of over 3 ft. do not leave a large margin for error. Thickness pieces were placed on the bottom of the mould and the main body core was centred on to these by means of laths. After final location of this core the steam box core was studded into position; the top moulding box was placed on and bolted to the middle part. The main cores were then packed to the box bars prior to being bolted to the top part. The mould was then split again at the bottom joint and metal thickness checked from that position to make certain that no movement of the main cores had taken place whilst the cores were being bolted to the top part. The mould was again blown out and was then ready for final closing.

It was considered necessary to ease the box portion of the core after casting. This was commenced 20 mins. after pouring, and the grids of the body core were also broken, thus making sure that there was nothing to restrict the contraction. Fig. 19 shows the casting looking from the bottom, and showing the inlets on the bottom joint. The metal used for these castings was gunmetal, and was tapped at 1,200 deg. C. minimum, the pouring temperature being 1,190 to 1,180 deg. C. The down runners were kept sealed with loamed plugs, and the runner box was kept full as previously explained. Fig. 20 shows the casting looking along the side. The stepped runner is clearly shown. The weight of dressed casting was 12 cwts.; the hydraulic test on the vapour box requires 40 lbs. per sq. in., and on the steam box 80 lbs. per sq. in. The rough dimensions of the casting are 3 ft. 3 in. high by 3 ft. 6 in. side to side, whilst the metal thickness at the vapour box is $\frac{5}{16}$ in. and at the steam box ¼ in.



FIGS. 16 (*left*) AND 17 (*right*).—VIEWS OF 6-STAGE PUMP CASTING AS FETTLED.

Grey Iron Evaporator Body

Fig. 21 shows the early stages of a loam mould for a grey iron evaporator body casting, weighing nearly 6 tons, average section being 1½ in. The first operation on this mould was a strickle to form

the bottom print and flange. Then the strickle shown at the bottom of the centre spindle was used to sweep the radius from this flange to the outside wall of the body. The bottom of this casting is strengthened by a series of ribs. The foot or base was made in a corebox: two cores placed together making the full core, and all were made in loam. The outline of a cast-iron brick can be seen in this view. One is built into each half core and wedged tightly to each grid. Two iron bricks are built into the main body core to correspond with these positions, so that when the mould is being finally cored up the studs and the main branch print will hold the core in the correct position without the risk of crushing either the mould or core face.

The centre hole in the bottom face is 9 in. dia. and 7½ in. deep. The metal thickness was formed by laying pieces of loam cake around the centre of the

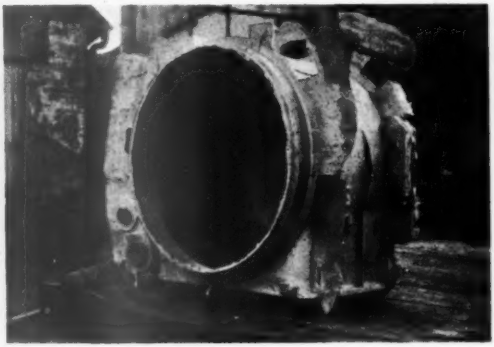


FIG. 18.—GUNMETAL EVAPORATOR BODY.

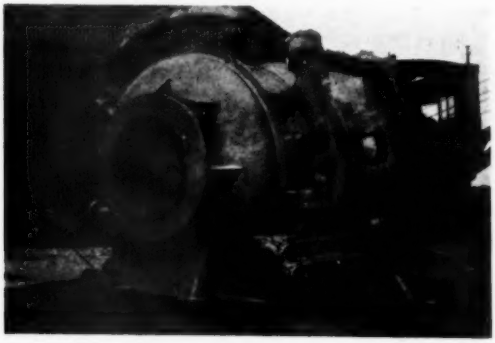


FIG. 19.—SHOWS THE GUNMETAL EVAPORATOR BODY WITH RUNNERS ATTACHED.

two bottom half cores, and the inside joints made up with stiff loam. All the ribs were filled up with waste, and the frame which is in two sections is placed into position and checked for dimensional accuracy. Strong sand is used on the top of these half bottom cores to form the metal thickness. Here and there are laid pieces of wood to indicate this thickness at different points.

The same strickle which was used to form the radius from the bottom flange was raised up the centre spindle 1½ in. and used again to sweep up the thickened bottom face, which was rammed fairly hard. The joint was assured by laying pieces of damp paper over the face. The building of the core was the next step towards the casting, and the first operation was making a grid for the centre hole in the bottom face. This was built up with loam cake and the grid wired firmly to the main grid. This main grid was kept well away from the mould face. Approximately every 6 in. or 7 in. around the outside ring were cast pieces of ¼ in. wrought iron wire about 8 in. long. These were bent to conform to the shape of the base of the mould, and wired again in two heights all around the circumference. This operation was to keep the cast in wire rigid enough to hold the coating of loam, strawband, ashes, etc., but not too rigid to retard the solid contraction of the casting. These extra precautions were taken because this portion of the core could not be eased after casting.

The bottom lifting plate, which was approximately 6 in. less in diameter than the core, was then bedded on to a coating of loam on the bottom grid, which was bolted to the bottom lifting plate in four places. This plate was cast with three staples 1½ in. dia., 15 in. long and six 3-in. square holes. Four of the square holes were used for the bolts between grid and plate and were left open. That is to say, all six holes were used to lead off the air from the bottom face, and where possible through the main branch to atmosphere. The rest of the air was carried through the brickwork to the top of the core. The centre of each course of bricks was rammed up with ashes that had passed through a ¼-in. riddle.

This view also shows the short strickle used to sweep up the core from the top rib to the top of the core inside the head. The long strickle was used for the back part of this core. The two down-runner pegs can also be seen on this photograph. They are 2½ in. dia., one ingate led from each down-runner being 3 in. wide and ¾ in. deep.

Fig. 22 shows the core almost completed. This core, commenced on a coating of loam on the lifting plate, was built with an 18-in. wall, or double brick, for two or three courses, to take the strain of the metal during casting. From this point to approximately 3 ft. from the base the wall was 13½ in., or one brick and a half thick, the rest being a 9-in. wall, or single brick.

Three further grids were built into this core

Founding of Pressure Castings

approximately every 2 ft., and loam cake or brick was built into the whole depth of the core in the two sides and back, opposite to the main branch, to facilitate the contraction. The top and bottom core grids were bolted together in three places around the

FIG. 20.—SIDE VIEW OF THE CASTING SHOWN IN FIG. 19.

inside of the core in order to make the whole assembly rigid. These bolts were not tightened up until the core was dry. The mould was the next operation. All the pockets between the ribs were filled up with stiff loam to the metal thickness of the ribs of 1¼-in. section. The bottom portion of the mould was built into a part of a moulding box in order to save tackle and enable the use of existing binders. The vents can be seen through the sides of the box, strawband being led from near the mould face to atmosphere. At the far side of the mould, opposite to the branch, the ribs continue horizontally all the way round, thus connecting the two pieces of frame. The metal thickness of this part of the mould is made by wooden laths laid up to the core. The ribs are held into position in each length by three pieces of wood, ⅛ in. by ⅛ in., which are removed after the core has been lifted out and the space made up with stiff loam.

The next step was the mould joint. This was made up to the top of the rib just showing over the box edge and leaving on the box approximately 1 in. of loam, which was levelled off and allowed to stiffen, thus making the first mould joint. The main reason for making a joint here was in case there was any difficulty in removing the frame, but this fear was premature, and the joint was never used. When this loam had stiffened another layer of loam was laid on, and the first lifting binder was clay washed on the underneath side and set on to the loam. The building started from here with a few small grids here and there in the pockets. All the bosses were loosened as the building proceeded. Another binder was placed around the middle and one on the top rib where another joint was made. A further lifting and one top binder was used for the straight top piece and the last joint made. A strickle board, 10¾ in. deep, 6 in. wide, was used to form the 9-in. head, thus leaving a 1¾-in. thick flange.

A grid was made to bolt to the top plate, which was swept up with loam. Two top runners, 3 in. by ¾ in. each, were made through this top plate for emergency purposes in case the mould did not fill rapidly enough, but it was not found to be necessary. When the building was completed, and before stripping for the stove, the building bars were placed

(*Continued on page* 244.)

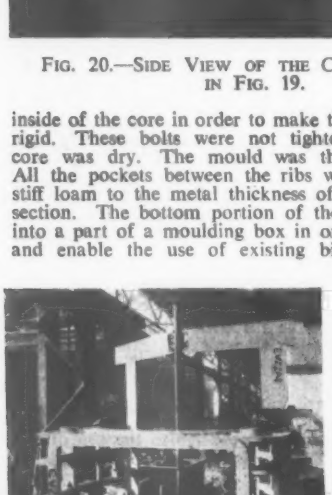


FIG. 21.—LOWER MOULD FOR GREY-IRON EVAPORATOR BODY.

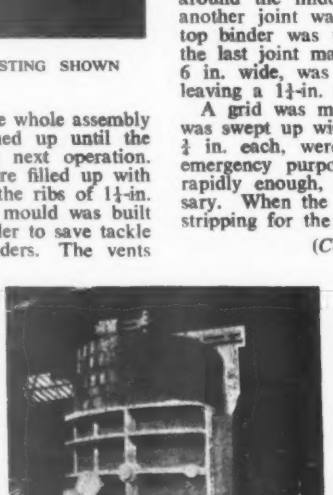


FIG. 22.—CORE FOR CAST-IRON EVAPORATOR BODY.

FIG. 23.—CASTING BEING MACHINED.

INDUSTRIAL FUEL ECONOMY DRIVE

JOINT TECHNICAL DISCUSSIONS

The industrial fuel efficiency campaign is being extended by the Fuel Efficiency Committee of the Ministry of Fuel and Power by promoting an exchange of ideas between different industries. A preliminary series of three meetings are being held to see how far methods used in one industry can be adapted for use in another. At the second meeting held in London recently, leading experts were present from nine different industries, all of which had in common the use of high temperature in their processes. Among those represented were the iron and steel, ironfounding, nickel, glass, pottery, refractories, cement and lime industries.

MR. STIRLING (Stewarts and Lloyds, Limited) opened the discussion and indicated that there was great scope for saving fuel in the design of the furnaces themselves. Improvements and modifications were incorporated every time a furnace was dismantled and rebuilt. The success of the campaign in his own firm was due largely to the keenness shown by furnace operators, after the management had explained how best they could help.

DR. SARJANT (Hadfields, Limited) stressed the importance of keeping regular records of fuel consumption per unit of output, and of watching the variations which were dependent on the shop programme. A heat balance was useful for this purpose. He also advocated the training of workmen, either by special courses arranged within the industry, or through the Ministry's training scheme.

MR. HUDSON (Mond Nickel Company) advocated the use of instructional films in order to be able to approach the factory operatives direct. It was suggested that there was scope for three different types of film: (1) Propaganda films showing the amount of heat lost when furnace doors were left open, expressed, for instance, in terms of the domestic fuel ration; (2) technical films, showing actual furnace operation, and how it worked; and (3) specialised films, relating to particular industries.

The question of utilising waste gases from high temperature furnaces for mould and core drying was discussed. It was pointed out that the intermittency of the process was the main difficulty and many furnaces were of the small portable type with no outside connections. In connection with the application of waste heat boilers an example was quoted of a factory where all office heating and hot water was obtained from a coil round the flues. The possibilities of developing the use of electric furnaces were considered, but the reducing atmosphere of the electric furnace was considered a drawback, whilst the cost of high-frequency furnaces was a deterrent to their general use.

MR. DRISCOLL (Fuel Efficiency Officer of the Ironfounding Industry) said that cupola furnaces were the largest fuel consuming units in the industry. A large volume of hot gases was evolved at a temperature of about 200 to 400 deg. C. except during the last part of the melt when it rose to 1,000 deg. C. Their use was restricted to core and mould drying on account of the intermittency of the process. The possibility of storing the gas, which contained twelve to thirteen per cent. CO_2 was discussed, but it was considered that its calorific value was too low to enable the mixture to be burnt when cold.

The discussions raised a wide range of technical problems and provided food for thought for the Ministry's Fuel Efficiency Committee. Whilst certain modifications to existing practice might profitably be introduced, there were points of advanced technique to be developed as a long-term policy. The Committee would consider how to make the fullest use of information which had been made available.

AMERICAN NON-FERROUS CASTINGS PRICES

More than $25,000,000 will be saved the American government and heavy industry in 1943 through reductions in foundry prices of 3 cents per lb. for aluminium and for magnesium, and 1½ cents per lb. for copper base castings, made by a revision of the price regulation for non-ferrous castings, effective February 1, 1943. The revised regulation also exempts from official price control foundries that do less than $12,500 worth of business in a quarter. Other changes include the addition of a new price base period between May 11, 1942, and January 31, 1943; the former base period of October 1 to 15, 1941, is also available. Also that current metal prices be used in pricing formulæ when pricing castings of a different class, and that foundries file their pricing formulæ with the O.P.A. These reductions in metal costs were the result of price reductions made by primary, secondary and scrap metal producers both through voluntary agreement with O.P.A. and because of O.P.A. orders, since late in 1941. The reduction in prices affects the price of castings used for tanks, airplanes, munitions, ships propellers and other vitally important products made or used by heavy industry, manufacturers of war equipment, the government and transport companies. Some foundries have already passed on the savings resulting from reduced metals costs.

Scrap from Slag Dumps

Slag dumps in America are providing an average of 50,000 tons of high-grade scrap each month. The practice of "mining" or reclaiming steel from these dumps was originated by the Republic Steel Corporation and the Carnegie-Illinois Steel Corporation, and has spread to many other companies. Some dumps are yielding 2,500 to 3,000 tons of scrap per month, consisting mainly of "skulls" and slag that "froze" in the bottoms of vessels, steel which slopped over when ingots were poured and steel droppings thrown out with the slag. Bulk of this type of scrap is used by blast furnaces and sells for $10 to $11 per ton, but some grades find a ready market at $20 per ton. The cost of reclaiming is estimated at $3 to $20 a ton.

CENTRIFUGAL BLAST CLEANING OF LARGE STEEL CASTINGS

The Wheelabrator airless abrasive-cleaning principle has now been successfully applied to the cleaning of large steel castings and forgings. Previously, these were cleaned manually in shot-blast rooms, and took considerable time and power owing to difficulty of manipulation. Tilghman's Patent Sand Blast Company, Limited (the sole licencees of the Wheelabrator in the British Empire, excepting Canada) have designed a plant which not only cleans these steel castings and forgings in a fraction of the time with the expenditure of less than a quarter the power, but will deal with almost any large unit.

The plant consists of a ¼-in. steel plate room, 13 ft. by 10 ft. by 8 ft. high, with 8-ft. dia. turntable, and opening roof, two Wheelabrator units, auxiliary shot-blast plant, and dust arrester. To load the room with the part requiring cleaning, arrangements are made to open the full area of the roof in two halves, both covers being counterbalanced. The forgings or castings are lowered on to the table by crane, an obvious advantage in a crowded foundry, though other types of openings can obviously be arranged. The operator then closes the roof, using one hand only. The room is rubber-sealed, allowing no leakage of dust to the outside atmosphere. The two Wheelabrator wheels, one in the top, the other in the side of the chamber, are then set in motion from outside by push-button control, and as the table slowly revolves, the whole of the load on the turntable is covered by the two controlled and directed streams of abrasive, precipitated—one almost vertically, the other horizontally—by centrifugal force from the rapidly rotating wheels. Each wheel is driven by a 15-h.p. motor. The wheel in the side can be raised or lowered according to the height of the piece to be cleaned. The spent abrasive collects in a hopper under the floor of the room, and drops by gravity into the boot of a bucket elevator, which raises it to an overhead hopper. This hopper contains a separating device for fines, nails, wire, etc., and abrasive. The abrasive falls by gravity to the two wheels or the pressure plant when in use.

Cleaning times vary, but usually about 10 to 20 mins. is sufficient to clean off all scale and sand, etc. Occasionally, however, the hidden surfaces of intricate pieces may require extra attention, and for this purpose a compressed air-operated unit is provided, worked manually with the operator in the room. Dressed in regulation protective clothing, and receiving pure air to his helmet through a filter, the shot-blaster touches up these hidden parts with concentrated abrasive from a 5- to 8-in. nozzle. The room is lit by two powerful lights in the walls, protected by wired ¼-in. glass, and dust is extracted at the necessary points by a 15 h.p. motor and fan to a V-bag dust arrester.

ANY MORE WASTE PAPER ?

FOUNDRY TECHNIQUE IN RELATION TO CERTAIN PRESSURE CASTINGS

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through the slots in the binders and wedged in with iron wedges. The space between the bars and bricks was filled in with stiff loam. This was to offset the strain on the mould during casting and to take full advantage of the strength of the binders.

When the mould was ready for stripping, the loam joints were marked in order to enable the mould joints to be put back in their correct position. The straight piece to the top of the rib on the outside was lifted off first. This was followed by taking the piece of frame away that covers the branch print. Next the core was lifted out, mended up and dried in the stove. The frame was taken apart, the mould mended up and dried with a muffle drier. After drying, the surfaces of both mould and core were roughened up and blacked whilst the parts were still warm.

The finished casting shown in Fig. 23 was eased through the top of the job through the main branch to the bottom core lifting plate, also all the way down the opposite side immediately after pouring, to allow the casting to contract normally. The oblong facing shown under the head was let into the mould wall. All the solid bosses were filled with studs and pipe nails to accelerate the solidification. The casting was tested to 220 lbs. per sq. in. hydraulic pressure at the vapour way and 480 lbs. per sq. in. at the steam way. These pressures are approximately double the working pressures.

The height of the casting with head was 7 ft. 5 in.: the outside diameter, 5 ft. 8½ in.; the inside diameter. 5 ft. 6 in., and the dimensions of the head 9 in. by 6 in. The total weight of casting and head was 5 tons 12 cwts., that of the head 12 cwts.

The analysis of the iron for this type of casting is:—T.C, 3.2 to 3.3; Si, 1.7 to 1.9; Mn, 0.6 to 0.7; S, 0.11, and P, 0.5 per cent. Fig. 23 shows the casting on the Bullard machine in process of having the head machined off.

Finally the author wishes to thank the management of Worthington-Simpson, Limited, for permission to give this Paper and for the use of the photographs.

(*The discussion will follow.*)

EXAMINATION OF CAST IRONS

The Pennsylvania State College has announced a new technique, which is said to be of great importance in the production of various types of cast iron for war purposes. It is possible to determine from examination of the surfaces of polished and etched castings the best temperatures at which to pour different kinds of high-tensile grey cast iron to obtain the greatest strength by the new method. Data on the physical properties and on the temperature for pouring the castings were obtained directly from study of the specially prepared surfaces or from photograph of these iron surfaces. The new process was developed by Dr. Charles R. Austin, professor of metallurgy, and M. M. Lipnick, of Pittsburgh.

THE RECOVERY OF METALS FROM SCRAP*

By SIR HAROLD HARTLEY, C.B.E., M.C., F.R.S.

The scrap metal problem is a potent economic and industrial factor calling for international supervision in the post-war period

The dominant feature of industrial development in the nineteenth century was the use of power, but closely associated with it, and of hardly less importance, was the enormous increase in the use of metals made possible by metallurgical progress. In 1800, for instance, the world production of iron and steel was about half a million tons; in 1900 it was forty million tons, and now is over three times as great. This rapid growth in the use of metals made serious inroads into the world reserves of ores, and in some countries the available resources, particularly of the richest ores, were exhausted or seriously depleted. Conservation has, therefore, become an urgent problem, and closely linked with this is the question of the ultimate fate of metals in service and their recovery as scrap. To what extent are they lost in use? To what extent do they follow man-made cycles like the well-known carbon cycle in nature, so that the world stock is not depleted?

There must be losses in the use of metals or alloys due to wear, corrosion, heat and dispersal which dissipate them so that they cannot be recovered; similarly, their use in chemical compounds such as pigments tends as a rule to total loss. The only examples of metals in which there is little such wastage apart from their use in plating or in thin films are the so-called precious metals, gold, silver, and the platinum group. An exact study of the fate of the industrial metals is impossible owing to the lack of accurate statistics, and to the uncertainty as to their secondary uses, but it is clear that in this century scrap is playing an increasingly large part in metal production and must enter into any comprehensive survey of world metal supplies in the future.

In the United States, for example, it is estimated that in recent years (1929-38) ferrous scrap has amounted to 75 per cent. of the output of steel, while non-ferrous scrap has accounted for 50, 45 and 35 per cent. of the total domestic consumption in all forms of copper, lead and aluminium respectively. Any prejudice against the re-use of scrap has disappeared with the evidence that with due precautions the secondary metal recovered by the secondary metal refineries is the equal of the primary production from the ore.

Each metal presents a different problem according to its nature and uses, but there are certain general aspects to be considered first in order to clarify as far as possible a somewhat confused and puzzling picture.

Definition of Scrap

The word "scrap" is used in this Paper in the sense usually understood to cover what are often described as secondary, reclaimed or runaround metals. Obviously there are different types of scrap which may be defined to indicate their origin as:—

Process Scrap.—Scrap arising in the production of a finished or semi-finished article before it reaches the machine shop, which is re-used in the plants of origin. This includes ingot heads, gates and risers from castings, crop ends of rolled material, trimmings from sheets, tubes, etc., all of which are normally returned to the melting furnaces in the same works.

Engineering Scrap.—Scrap such as swarf, drillings, turnings and rejects produced in engineering shops which are usually separated from the primary production, so that this scrap cannot be so quickly absorbed. Further, its physical character and high degree of oxidation often make it difficult to use in remelting furnaces. This has brought into existence a new branch of the non-ferrous industry, the secondary metal refiners, whose function is the recovery of metal from engineering and old scrap.

Old Scrap.—This consists of disused material arising from obsolescence, accident and wear. Recovery of this is a skilled trade involving the breaking up of machinery into its component scrap categories, *e.g.*, a motor-car may contain no less than 25 different ferrous alloys and the same number of non-ferrous alloys.

It is, of course, impossible to make hard-and-fast distinctions between these three classes, particularly between the first two, but these two classes cover new scrap, metal that has not been in service, as distinct from old scrap. Scrap of the last two classes may, however, easily get mixed in the process of collection before reaching the producer again.

Disposal of Scrap

The disposal of scrap metals and their use to the best advantage is becoming more complicated each year owing to the increasing use of alloys. The whole problem would be vastly simpler if metals were used mainly in a pure state or admixed in the case of iron with carbon alone. In many cases, *e.g.*, bearing metals and tool steels, the alloys are kept separately in the process of collection for re-use after remelting and adjustment of their composition, as the recovery of the constituent metals from their alloys would be a wasteful and often a difficult and uneconomical operation. The sorting and classification of scrap is therefore a matter of great importance. For process scrap it is an easy matter, as this goes straight back to its own melting furnace. For engineering scrap the segregation is relatively easy if it is properly organised in each works, but the scientific sorting of old scrap presents much greater difficulties and requires careful organisation to avoid waste. The higher prices paid for special alloys are an incentive to make the sorting as effective

* Paper read at the British Association Conference on Mineral Resources and the Atlantic Charter.

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as possible. However, this is not so easy with small admixtures of alloy metals and increasing difficulties are arising from the presence of these in undesirable quantities in the recovered metal.

One of the main difficulties of getting a true statistical picture of scrap recovery is the extent to which certain scrap is re-used directly without coming into the market. This applies to all process scrap and to a certain amount of engineering scrap which is recovered directly, *e.g.*, brass turnings go direct back to the brassfoundry. In large organisations there is also a considerable internal re-use of old scrap which would not appear in any statistics. For instance, railway chairs go back to the foundry which may use as much as 95 per cent. of old scrap. Bearing metals are also recovered internally and remelted with the necessary additions of virgin metals, which alone appear in the statistics. Similarly, copper scrap must reach the brassfoundry unaccounted for, as the amount of copper used in brass-making is less than the equivalent amount of zinc which is known to be used for this purpose.

The picture is complicated further by the re-use of suitable old scrap for the direct manufacture of other articles. For example, the re-rolling of old rails to produce a variety of articles is carried out on a considerable but unrecorded scale, and locomotive axles can be forged down and heat-treated to make crank pins of smaller diameter, or used for many other purposes. Small bars of mild steel can be used for drop forgings. The refabrication of old scrap has been greatly helped in recent years by welding, and especially during the war has made considerable progress. Much of this re-use of scrap which makes a considerable contribution to the conservation of mineral resources does not appear in any statistical review.

Relationship between Total Production and Scrap Recovery

The volume of consumption of metals at any moment depends on new demands and on replacements due to obsolescence, corrosion and wear and tear. It is therefore clear that, unless there should be heavy accumulations of scrap or new demands had vanished in a severe depression, the amount of scrap arising from replacements must always be less than the total amounts of metal required for current production. The relation between the two will vary with the metal and the circumstances. What are the main factors that influence the volume and rate of return of scrap?

With the modern tendency to rapid development and quicker obsolescence, the life cycle of metals will in general be shortened. On the other hand, welding has made possible the repair of steel, *e.g.*, at rail ends and in locomotive fireboxes, which will increase the service life of metals. The development of improved materials with increased hardness, greater resistance to wear and fatigue, and to corrosion (including painting and surface treatment) also tends to lengthen the life cycle and eliminate losses of metal. The use of lighter designs, the increasing use of sheet metal and of a multiplicity of small gadgets may, however, tend to make scrap recovery less complete.

An interesting point arises in connection with the increased use of reinforced concrete in place of steel construction. This effects a considerable saving of steel amounting to 50 or 60 per cent., but, on the other hand, it is not economical to recover much of the steel in reinforced concrete, while the bulk of a steel frame can be salvaged.

For iron and steel, corrosion is the biggest factor, which Speller estimates may lead to an annual replacement of 2 per cent. of the total tonnage in use. For other metals the effect is much less, as is shown in the following table giving the results of exposure of metals in the industrial atmospheres of Birmingham and Sheffield. The two sets of results are expressed differently, but the metals appear roughly in the same order in each.

Relative Atmospheric Corrodibility of Metals.

Metal.	Friend, *J. Inst. Metals*, 1929, 42. (Seven years in Birmingham City air). Loss of weight, per cent.	Hudson, "Corrosion of Iron and Steel," 1940. (Sheffield industrial atmosphere.) Rate of corrosion, (mils per year).
Mild steel	10.3	5.0
Wrought iron ..	6.7	3.8
Cast iron	3.5 (approx.)	Good resistance.
Zinc	0.54	0.70
Nickel..	0.47	0.41
70/30 Brass (2 Pb) ..	0.39	0.57
Copper	0.18	0.28
Aluminium	0.11	—
Tin	0.10	—
Lead (soft)	0.09	0.26
Stainless steel (12 Cr)	0.10	—
18 Cr, 8 Ni.. ..	—	0.003

When all these variable factors are taken into account, and also the uncertain statistics as to the use of scrap, it is not surprising that it is impossible to draw up an exact balance-sheet covering losses and recovery of any metal, as will be seen in the sections dealing with the separate metals.

Iron and Steel

At present iron and steel represent about 93 per cent. of the total world tonnage of metal production. This figure, however, would give quite a wrong impression of the relative importance of ferrous and non-ferrous scrap recovery, as in U.S.A. the actual value of the small proportion of non-ferrous production is roughly equal to that of the much greater amount of pig-iron. It has been estimated that of the total output of iron and steel, 15 to 20 per cent. is lost from rusting, and that in all 35 per cent. is lost irrecoverably due to rust, dispersal, and the use of

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iron and steel in articles from which recovery is uneconomic. Sixty-five per cent. is thus left to find its way back into use, of which 25 per cent. is process scrap which does not leave the steelworks, and the remaining 40 per cent. returns at a rate dependent on obsolescence, wear and the state of industrial activity. With improved protection against rusting, losses will be reduced, but quicker obsolescence will shorten the life cycle.

The following figures (in millions of tons) for recent steel production in this country confirm this estimate, remembering that some scrap goes to blast furnaces and that an addition must be made to the percentage of scrap in the table to allow for this:—

Year.	Total Production	Pig used.	Scrap used.	Per cent. scrap.
1935 ..	9.6	4.6	5.8	56.0
1936 ..	11.8	5.6	6.9	55.0
1937 ..	12.9	6.2	7.5	55.0

The recovery of ferrous scrap in the United States has reached a higher figure in recent years, averaging 75 per cent. of the steel production, possibly due to quicker obsolescence.

The main difficulty which has arisen in the recovery of ferrous scrap is due to the increase in the number of alloys, which makes it increasingly difficult to segregate scrap of similar character. The result is that the amount of the residual elements tends to increase in ordinary steel, producing undesirable results. For example, the presence of nickel and chromium may produce a steel very different in characteristics from the steel required. Rejection has occurred from this cause, emphasising the importance of improved methods for segregating most carefully scrap from alloy steels of various compositions, in order to utilise them most economically and to avoid the presence of elements which may upset the normal properties of the steel. The introduction of controlled grain-size straight carbon steels often avoids the need for using alloy steels, and they have the additional advantage of simplifying the recovery of scrap, since they contain no other elements.

In the case of alloys with a high percentage of other elements, *e.g.*, stainless steel, or tool steels, the large differential in scrap price is an incentive to see that they are kept separate.

Manganese, Nickel and Chromium

There is only a small recovery of manganese in the form of high manganese alloys, as the bulk of it is used in steel manufacture as a deoxidiser and desulphuriser and is lost in the slag.

Only a small percentage of nickel is recovered, as much of it is lost in low nickel steel alloys which go into ordinary scrap or in nickel plating. Undoubtedly more could be saved by the segregation of nickel alloys. Recovery is presumably better for the high nickel alloys. In the United States scrap recovery has progressed steadily, and in 1938 was about 2,000 tons, which is, however, only a small percentage of consumption.

Little is known about the recovery of chromium except that its high price encourages recovery by producers and fabricators of the alloys and by large consumers. The expanding demands for chromium steels will make the segregation of chromium alloy scrap of increasing importance.

Copper

The United States statistics for copper recovery are more complete than for any other metal, and so it is possible to give a clear picture of the position. Owing to its relative freedom from corrosion wastage should be relatively small and the value of the scrap is favourable for salvage.

Copper is recovered and passes into use again both as metal and as brass and other alloys, and it is important to distinguish between the two. United States statistics for 1929-1938 show that of the domestic consumption of copper metal, approximately 6¼ million tons in those years, 2½ million tons or 39 per cent. came from scrap recovery. Of this roughly one-third came from new scrap (process and engineering) and two-thirds from old scrap. Scrap recovery in addition yielded nearly two million tons of copper in the form of brass or alloys which were re-used. The total contribution of recovery, therefore, to the domestic use of copper in all forms was approximately 50 per cent. for this period.

The trend of scrap recovery over a period of years shows a close relation to the index of industrial production. Increasing properity means new consumption and the quicker replacement of obsolescent articles. Increased production means increased new scrap, and the flow of old scrap depends on the rate of replacement. Apart from stocks this flow is in fact a direct function of current consumption. Hence it is not surprising that the volume of scrap recovery of copper should be related more closely to the index of production than to current scrap prices. The length of the life cycle of copper is not fixed, but will vary with the level of industrial activity, and other factors such as the production of quickly obsolescent designs.

Tin

About half the total tin production is used as pure metal for making tinplate and as foil for various purposes. The rest is used in various alloys, solder, bearing metal and bronzes. Tin is recovered from the clean tin scrap and from the dross arising in the course of manufacture of tinplate, but the recovery of tin from used cans is not in general economical owing to the difficulty of collecting and cleaning them. There is also a considerable recovery from tin alloys. United States statistics for 1929-38 show a recovery of metallic tin from scrap amounting to 8 per cent. of the total consumption as pure tin and alloy, and a recovery in the alloy form amounting to 26 per

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cent., so that on an average one-third of the consumption in all forms was provided from the recovery of scrap. About 6 per cent. of the tin is used in various chemical compounds, and this is irrecoverable.

Lead

The major uses for lead are storage batteries, cable covering, sheet and pipe, and a small proportion is used in alloys. The processes of manufacture are relatively simple and they result in little process or engineering scrap. Owing to the relatively large percentage of lead used in pigments, in ammunition and as tetraethyl lead in motor spirit, and the loss of bearing metals by wear, there is inevitably a considerable irrecoverable loss. On the other hand, the recovery from storage batteries probably amounts to 80 per cent. after an average cycle of two or three years in motor vehicles, while the cable covering is also largely recovered after a longer period of years.

United States statistics for 1929-38 show that the recovery of lead as metal produced 1,349,000 tons, one-third of the total production of refined lead during that period, and that in addition, 1,017,000 tons were recovered in the form of alloys, thus saving an equal quantity of virgin metal.

Zinc

A large proportion (probably 40 per cent.) of zinc production is used for galvanising iron to protect it against corrosion, and none of this is recovered, the zinc being sacrificed for the protection of the so-called iron, but which to-day is mild steel. However, there is a wastage of some 20 per cent. of zinc in the galvanising pot; much of this is recovered as dross, which is redistilled for spelter or zinc dust. The next largest use of zinc is for brass-making, a considerable proportion of which is recovered and re-used. Apart from this, there is only a small recovery of zinc from the articles in which it appears in the rolled form. The United States statistics show that the recovery of zinc as metal has averaged 11 per cent. of metal production, and in addition slightly less has been recovered in the form of alloys. A considerable loss occurs each year from the use of zinc in pigments.

Aluminium

There is a considerable scrap recovery of aluminium and aluminium alloys. Process scrap is usually remelted in the works where it is produced. Engineering scrap (turnings, millings, filings, etc.), which may amount to 50 to 200 per cent. of the weight of the finished article, requires special methods of melting to ensure both a good yield and quality and is usually returned to specialist firms, the secondary metal melters. The segregation and cleaning of the various types of scrap is of great importance.

Old scrap presents a more difficult problem, as it has to be separated into the different alloys, a skilled job requiring experience and the use of scientific methods. United States statistics for 1929-38 show that out of a total production of one million tons of metal, one-fifth came from scrap recovery. In addition, about 225,000 tons of aluminium was recovered in the form of various alloys, making the total contribution of scrap to consumption in this period about 35 per cent.

Export of Scrap

Nothing has been said yet about the export of scrap, but to secure maximum recovery there should be a flow back to metal producing from non-producing countries. The statistics for iron and steel scrap which are fairly complete do show this in a few cases, such as Holland and Switzerland, but the bulk of the transfer of scrap, which averaged 5 million tons a year for 1933-38, actually took place between steelmaking countries owing largely to preparations for war. Under happier auspices the International Scrap Convention established in 1937 might have done much to avoid this uneconomical transfer. The flow of scrap to the Axis countries in the pre-war years shows how little cause for complaint they had in respect of their free access to the world's metal resources.

Conclusion

The absence of world statistics on the recovery of scrap makes it impossible to give a comprehensive picture of its full significance. However, it is clear from the data given above that scrap recovery will be of increasing importance as regards the conservation of our metal resources, and that as a major source of raw materials it must be brought into any general scheme affecting them under the Atlantic Charter.

Taking conservation first, the following measures would assist the maximum recovery of scrap and help to diminish wastage of metals:—(1) The salvage of all new and as much old scrap as possible. (2) The adoption of an international convention for marking material made from the main types of alloys to help in their subsequent identification and recovery. (3) Improved methods for segregating engineering scrap of different kinds so as to avoid mixing different metals and alloys. (4) Improved methods for sorting and cleaning old scrap and identifying doubtful material by quick tests. (5) Improved methods for cleaning scrap and getting it into a suitable form for remelting. (6) Arrangements to avoid losses by corrosion when scrap, often finely divided, is kept for long periods. (7) Avoidance of the unnecessary use of alloys which complicates scrap recovery, and the reduction of the number of alloy specifications to the minimum necessary. (8) Improved methods for protecting metals against corrosion. (9) The re-use of old scrap by fabrication and welding.

Turning now to the inclusion of scrap metals in any general scheme for metal supplies under the Atlantic Charter, the first essential is the compilation of international statistics on an agreed basis. Even if these cannot be complete owing to the difficulty of including old scrap which is re-used by works in-

(*Concluded on page* 250.)

GERMAN INDUSTRIAL FINANCE

Throughout German industry, increases in capital have been a common feature for some time, either by the issue of new shares, the writing up of the nominal value of shares, or the distribution of profits in excess of the statutory 6 per cent. which is now being paid by nearly all those concerns actively engaged in the manufacture of armaments and military equipment. During 1942, industrial concerns in Germany increased their capital by a total of 1,022 million Rmk., against 1,747 million in 1941 and 862 million Rmk. in 1940. Last November, no less than 44 important firms raised their capital issues from a total value of 201.31 million Rmk. to 299.41 million Rmk., an average increase of 49 per cent. The rate of increase in the iron and steel industries is, in general, less than the general average.

Last year a new record was established in the total value of industrial loans floated, *viz.*, 1,164 million Rmk., against 671 million in 1941, 897 million in 1940, and 536 million in 1939. The 1942 total includes conversion loans to a total of 318 million Rmk., the aggregate of which has also increased in recent years; they amounted to 23 million Rmk. in 1939, 14 million in 1940, and 136 million in 1941. The new capital invested in German industry, exclusive of conversion loans, thus totalled nearly 1,900 million Rmk. in 1942, against 2,282 million in 1941 and 1,745 million in 1940, an average of nearly 2,000 million Rmk. per annum since the beginning of the war. Share values have been appreciating year by year; taking quotations on the Berlin exchange and the average for 1924 to 1926 as 100, the average value of shares in mining and heavy industries was 106 in December, 1938, 116 at the end of 1939, 145 at the end of 1940, 151 at the end of 1941, and 157 at the end of 1942.

As regards the profit-earning capacity of German industrial concerns, an analysis of the 1941 accounts of 690 public companies in Germany is presented by Dr. G. Plum in a recent issue of the "Rhein-Mainische Wirtschafts-Zeitung"; only those companies are taken which have not increased their capital from the 1940 level, thus allowing a direct comparison of financial results in the two years 1940 and 1941. Of the 690 companies selected, 435 paid the same dividend as in 1940, 21 resumed paying dividends, 44 increased dividends, 39 reduced dividends, 11 paid no dividend in 1941, and 101 paid no dividend in both years. The engineering works in the list mostly maintained their dividends. No particulars are given for iron and steel works, although some were included in the survey.

The February issue of "The Nickel Bulletin" contains abstracts dealing with a number of subjects of current interest, notably a quick method for identifying metallic coatings; recovery of nickel from plating solutions; national emergency steels; the relation of hardenability to weldability; the influence of boron as an alloying element. Copies of the "Bulletin" may be obtained, free of charge, from The Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

BETHLEHEM PULLS ITS WEIGHT

The Bethlehem Steel Company reviews its contribution to the war effort in a recent issue of "Bethlehem Review." The company now has the greatest combined naval and merchant shipbuilding programme in hand, ever undertaken by one organisation. It is America's largest producer of heavy ordnance, including gun forgings, forged armour plate, shells, bombs, projectiles, etc., and in a recent month produced a record of 1,100,000 tons of steel ingots. Blast furnace "H" at Lackawanna plant recently set a new world's record in pig-iron production—46,246 tons. Two new open-hearths have been added on the Pacific Coast, making a 100,000-ton gain in gross annual capacity of the company, Present peak production is "not good enough," says Mr. E. G. Grace, the president, urging still higher goals, in his message to employees. There are now 18,000 Bethlehem employees in the Armed Services. Employment in December was approximately 260,000, or 90,000 more than a year before. The company is conducting an extensive apprentice and training programme, and is also training women to fill some production posts.

DANISH STEELWORKS' SHORT LIFE

The new Danish steelworks, the Frederiksvaerk, Seeland, which was recently started up on a scrap basis, has been seriously damaged by a fire of undefined origin. It is understood that substantial parts of the works have been put out of commission and that rebuilding of some departments will begin immediately. The Frederiksvaerk company was formed with the active co-operation of the Burmeister & Wain shipbuilding concern and has a share capital of 9,500,000 kr. The works, which cost 14,500,000 kr. to build, are designed for an annual capacity of 40,000 tons of steel, produced from about 50,000 tons of scrap. This output, which had not yet been reached and up to the fire consisted mainly of shapes and rounds, would not have materially affected iron and steel imports which before the war had closely approached 500,000 tons annually. A scrap basis for these works was a natural outcome of the scrap situation in Denmark, whose scrap exports have been substantial for such a small country, *viz.*, 123,000 tons in 1937 and 90,000 tons in 1938, mainly from the engineering workshops.

Eisen und Stahlwerks-Gemeinschaft (Esge), formed as the principal subsidiary of the Reichsvereinigung Eisen, has superseded the Rohstahlgemeinschaft and all other syndicates in the German iron and steel industry. Judging from various articles in the German Press on its constitution and purpose, its chief aim is to provide a super-authoritarian organisation under State control, to control and supervise every branch of the German iron and steel industry, *viz.*, production, plant and capacity, finance and selling prices. It will also exercise a closer control of the selling and marketing arrangements of the industry.

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(*Concluded from page* 248.)

ternally and so-called runaround scrap such as bearing metal, which circulates internally, and therefore does not come into account, it should be possible to collect data for all process scrap, engineering scrap, or old scrap which reaches the market, so as to see to what extent consumption in each country can be met from virgin metal or from scrap.

The need for such statistics was emphasised in the following passage from the Report of the National Resources Board of the United States appointed by President Roosevelt in 1934:—

"The subject of scrap is the great blind spot of the world's metal economy. Despite the importance of secondary metals no statistics of an international character can be had. The United States is the only Government compiling figures of secondary metal production. The present annual statistics of the Bureau of Mines should be established on a quarterly or monthly basis and expanded to include stocks and consumption as well as output. This is one of the most constructive steps that could be taken for stabilisation of the metal industries. Until the importance of scrap is recognised, effective adjustment of supply and demand in the metal industries will remain difficult or impossible."

This was written in 1935 with special reference to the United States; to-day in the light of the Atlantic Charter it has a much wider significance.

SUPPLY OF ELECTRICAL EQUIPMENT

There are certain items of electrical machinery and equipment which enter into almost every phase of war production as well as being required by the Fighting Services for many operational purposes.

In order to ensure a balanced supply of these items their production is centrally planned by the Directorate of Industrial Electrical Equipment, a department within the organisation of the Controller-General of Machine Tools. The range of equipment for which the D.I.E.E. is responsible is as follows:—

(*a*) Rotating electrical machinery and plant up to and including 1,000 k.v.a. (a.c.), 1,000 kw. (d.c.) or 1,000 b.h.p. (a.c. or d.c.).

(*b*) Electrical control equipment for use with machinery and plant defined in (*a*).

(*c*) Electrical switchgear and fusegear for use on circuits up to and including 650 volts.

(*d*) Static condensers for power factor correction.

Any electrical plant and equipment (1) required by the Admiralty for use on board ship or in shore establishments where their special requirements apply, or (2) specially developed by the Ministry of Aircraft Production for use with radio equipment or required by the Ministry of Aircraft Production for use in aircraft, is excluded from the above.

The D.I.E.E. has information regarding the capacity and loading of each electrical manufacturer and, wherever necessary, allocates demands and arranges the distribution of the load to ensure that the productive capacity is used to best advantage.

WELLMAN SMITH OWEN ENGINEERING

STEELMAKERS JOIN BOARD

The Wellman Smith Owen Engineering Corporation, Limited, have announced that Sir Walter Benton Jones, Bt., chairman of the United Steel Companies, Limited; Mr. Allan C. Macdiarmid, chairman of Stewarts and Lloyds, Limited; Mr. John E. James, chairman and managing director of the Lancashire Steel Corporation, Limited; and Mr. G. S. McLay, a director of Stewarts and Lloyds, have joined the board of Wellman Smith Owen. The new directors hold many other directorships of coal, iron and steel and associated concerns. Wellman Smith Owen, it may be recalled, with a capital of over a quarter of a million, specialise in the manufacture of iron and steel works' equipment, and are allied with the Wellman Engineering Company, Cleveland, Ohio, U.S.A. Sir S. Roberts, Bt., is chairman of the British concern, and Mr. J. Foster-Smith, managing director.

OBITUARY

MR. JAMES MELVILLE STEWART, for many years secretary of Watson, Gow & Company, Limited, iron-founders, Falkirk, died recently.

MR. LANCELOT EDWARD FRESTON BAENZIGER, secretary of the Skefko Ball Bearing Company, Limited, Luton, died suddenly last week, aged 58.

MR. HUGH ROBERTSON PHILP, who was for many years manager of the Carntyne Steel Castings Company, Limited, Renfrew, died recently, at Dundee.

MR. FREDERICK SIMMS, of Walsall, died recently at the age of 57. Mr. Simms commenced work with Gill & Russell, Limited, Cyclops Tube Works, Walsall, and eventually became a director and general manager of the company. He was well known in the tube trade.

NICKEL SUPPLIES

The net profit of the International Nickel Company of Canada, Limited, for 1942 amounted to $33,301,829 after taxation, a decrease of $1,054,572 as compared with the figure for 1941.

The promised increase in the production rate of 50,000,000 lbs. over the 1940 rate, it is stated, was attained. Work on production expansion has progressed according to schedule and is largely completed. All of the works ran continuously throughout the year. In regard to the future, Mr. Robert C. Stanley, the chairman and president, states that the expanded production of nickel already attained, coupled with conservation in its applications and organised salvage of nickel-bearing scrap, has eased a threatened shortage of supply. It would now appear that a sufficient tonnage is available to meet all vital requirements.

NEWS IN BRIEF

VICKERS ARMSTRONGS Employees' Medical Fund has presented £700 to the Newcastle Eye Infirmary, in addition to the usual quarterly contribution of £30.

MAJOR SIDNEY H. BINGHAM, United States Army, is the first American officer in the war to be elected a member of the British Institution of Mechanical Engineers.

THE MINISTER OF AIRCRAFT PRODUCTION has appointed Mr. Kenneth A. Layton-Bennett to be authorised controller of Short Bros. (Rochester & Bedford), Limited.

RICHARD LLOYD & COMPANY, LIMITED, machine-tool equipment manufacturers, have called an extraordinary meeting for March 30 to consider a resolution that the name be changed to Richard Lloyd, Limited.

BELIEVING that after the war there will be a slump in shipbuilding and engineering, Sunderland Corporation Post-War Planning Committee is considering what steps can be taken to attract new light industries to the town.

WALLWORK GEARS, LIMITED, of Manchester, precision moulding machine and foundry equipment manufacturers, have recently opened a London office at Oceanic House, 1A, Cockspur Street, S.W.1 (tel.: Whitehall 8051).

THE MINISTER OF LABOUR and National Service has ordered a registration of all engineers, whether employers or employed, of 20 to 45 years of age with certain qualifications. The registration will be completed by Saturday.

THE ANNUAL GENERAL MEETING of the London Local Section of the Institute of Metals will be held at the Junior Institution of Engineers (Incorporated), 39, Victoria Street, S.W.1, on Thursday, April 15, at 6.30 p.m. Mr. A. J. Murphy, the new chairman, will give an address on "Castings and Forgings."

"SIF-TIPS," the house organ of the Suffolk Iron Foundry (1920), Limited, Stowmarket, is now appearing quarterly. In future it can only be supplied against an annual subscription of 2s. The winter issue (Vol. 8, No. 43) has just been published. It is well illustrated and the technical information is, as usual, conveyed in a popular conversational style.

THE MINISTER OF SUPPLY has appointed Mr. Ralph Wilkins to be Director of Supplies (Special) in the Department of the Director-General of Equipment and Stores. This directorate will be responsible for the production and reconditioning of kegs, drums and steel barrels. Mr. Harold N. Butler, formerly Deputy Controller of Molasses, has been appointed Deputy Director of Supplies (Special).

MR. ERNEST BEVIN, Minister of Labour and National Service, has appointed an Industrial Health Advisory Committee, and announces the holding in April of a three-day conference on industrial health, to which representatives of the Dominions will be invited, as well as representatives of organisations in this country interested in the physical well-being of the working population. The advisory committee will be attached to the Ministry of Labour.

A MOTION asking local M.P.s to satisfy themselves that the proposals in the Hydro-Electric (Scotland) Bill would not be allowed prejudicially to affect the economic position of Wales and Monmouthshire, was adopted last week by the Parliamentary Committee of the Cardiff City Council. The recommendation followed discussion of a memorandum prepared by the National Industrial Development Council of Wales and Monmouthshire which argued that the scheme for the Scottish Highlands might attract industries already located in South Wales and Monmouthshire.

"WAGON STANDAGE SCHEMES" have been introduced at iron and steel works and at chemical works in an endeavour to simplify the operation of the demurrage regulations and to help in improving the turn-round of freight wagons. This was announced by Sir Ronald W. Matthews (chairman) at the annual meeting of the London & North Eastern Railway Company, who added that the schemes had been approved by the Ministry of War Transport and introduced by arrangement with the traders concerned. The schemes, broadly speaking, covered all the inward and outward loaded wagons and the empty wagons supplied for outward loading, and would, it was hoped, remove many of the difficulties that had in the past been experienced in connection with wagon demurrage.

TWO CHANGES will be made on May 1, 1943, in the tax deduction scheme for salaried employees and weekly wage earners. If an assessment is adjusted, and the amount of tax already deducted exceeds the corrected amount due for the whole deduction period, the employer will at once refund the excess to the taxpayer. It will no longer be necessary for the taxpayer to claim repayment from the Revenue, unless in exceptional circumstances the refund cannot be made by the employer. The other change provides that on leaving his employment the taxpayer will be given by his employer a form showing the amount of his normal weekly or monthly tax deduction. On taking up new employment he gives this form to his new employer, who will continue the deductions shown until otherwise instructed.

MUSIC IN FACTORIES

The Court of Appeal last week dismissed appeals by Ernest Turner Electrical Instruments, Limited, and Gillette Industries, Limited, from decisions of Mr. Justice Bennett, regarding the broadcasting of music in their factories.

The Master of the Rolls, in giving judgment in the Court of Appeal, said that an owner of copyright was entitled to be paid for the use of his property even if the use concerned the public welfare to a very considerable extent. The diffusion of music by broadcast on a factory was a performance in public. The appeals would be dismissed.

Leave to appeal to the House of Lords was refused.

COMPANY NEWS

(Figures for previous year in brackets.)

P. & W. MacLellan—Dividend of 6% (same).

Bruntons (Musselburgh)—Dividend of 20% (same).

A. A. Jones & Shipman—Dividend of 10% (same).

Wallis Tin Stamping—Interim dividend of 7½% (same).

National Gas & Oil Engine—Ordinary dividend of 5% (same).

Halesowen Steel—Final dividend of 17½%, making 25% (same).

Briggs Motor Bodies—Ordinary dividend of 7% for 1942 (same).

Harris & Sheldon—Final dividend of 7½%, making 10% (same).

Clayton Dewandre—Final dividend of 6%, making 10% (same).

Projectile & Engineering—Final dividend of 12½%, making 20% (same).

J. Samuel White & Company—Interim dividend of 2½%, tax free (same).

Blythe Colour Works—Net profit, £33,506 (£28,280); dividend of 5% (same).

Associated Electrical Industries—Dividend of 10% on the ordinary shares (same).

Hadfields—Final dividend on the ordinary capital of 15%, making 22½% (same).

Brown Bayley's Steel Works—Interim ordinary dividend of 5%, free of tax (same).

E.N.V. Engineering—Final dividend of 10%, making 17½%, plus a bonus of 8¾% (same).

Glover & Main—Final dividend of 8¾%, making 12½% (same), and a bonus of 7½% (4¾%).

Watford Electric & Manufacturing—Second interim dividend in lieu of final of 10%, making 15% (same).

Radiation—Net profit for 1942, after tax, £145,913 (£130,432); dividend of 8% (6%) on the ordinary stock.

Swan, Hunter & Wigham Richardson—Final dividend of 6% on the ordinary shares, making 10% (same).

Enfield Cable Works—Net profit for 1942, before taxation, £166,623 (£217,039); ordinary dividend of 12½% (same).

Bearpark Coal & Coke—Net profit for 1942, £14,537 (£21,265); dividend of 5% (7½%); forward, £4,214 (£3,852).

Thos. Firth & John Brown—Final dividend of 5½%, free of tax, making 10%, free of tax, on the ordinary shares for 1942 (same).

Electrolytic Zinc of Australasia—Dividend of 4% on the preferred and ordinary shares for the half-year ended December 31, 1942.

John C. Parkes & Sons—Net profit for 1942, £3,203; debenture interest, £1,406; dividend of 10% (same); forward, £12,016 (£10,763).

Darlington & Simpson Rolling Mills—Dividends on the 5½% first and 6% second cumulative preference shares for the half-year to March 31, 1943.

Universal Grinding Wheel Company—Participating dividend of 2% (1%) on the preference shares for the year ended September 30, 1942, making 7% (6%).

Coltness Iron—Net profit for 1942, £135,563 (£138,265); final dividend of 2s., or 13½%, making 2s. 9d., or 18½% (same); forward, £259,355 (£261,823).

Worthington-Simpson—Dividend of 3% on the 6% cumulative preference shares in respect of the half-year ended December 31, 1942. Ordinary dividend of 7% (same).

Vickers—Net profit for 1942, after providing for taxation, £962,600 (£908,905); to contingencies, £250,000 (£250,000); ordinary dividend of 10% (same); forward, £783,447 (£690,786).

Lancashire Dynamo & Crypto—Net profit for 1942, after tax, £122,020 (£111,015); final dividend on the ordinary shares of 10% (same), plus a bonus of 7½% (5%), making 22½% (20%).

Federated Foundries—Profit for 1942, after expenses and income-tax, £42,386 (£27,115); to additional depreciation reserve, £15,000 (nil); two years' preference dividend to December 31, 1941, £15,610; forward, £17,590 (£5,814).

PERSONAL

MR. WILLIAM SCOTT, who has been elected a magistrate for Jarrow, is a director of Jarrow Metal Industries, Limited.

MR. A. E. MELLERUP, director of R. A. Lister & Company, Limited, of Dursley, Glos, and Blackstone & Company, Limited, of Stamford, was presented with souvenirs of his 49th year of service with Lister's, 22 of them as a director, by the directors, staff and workers of both firms on the occasion of his 70th birthday recently. Mr. Mellerup, who is of Danish descent, was for long closely associated with the founder of the firm, the late Sir Ashton Lister. He is a recognised expert on machine tools and modern mass-production methods. In 1937 he made an extensive investigation into mechanical equipment in the United States, as a result of which Lister's established their mechanised foundry, the most up-to-date plant of its kind in the country.

Wills

WHITEHOUSE, SIR JULIAN O., of Cannock, managing director of Cornelius Whitehouse & Sons, Limited, edge-tool makers £12,365

FINDLAY, C. K., of West Kilbride, Ayrshire, and of Glasgow, a director of Penman & Company, Limited, boilermakers, and other companies ... £30,387

CONTRACTS OPEN

The date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Armagh, March 30—Cast-iron pipes, lead pipes, etc., for 12 months from April 1, for the Urban District Council. Mr. V. M. Conran, town clerk, City Hall, Armagh.

Bridgwater, April 10—9-in. dia. spun-iron pumping main, etc., for the Corporation. John Taylor & Sons, Artillery House, Artillery Row, Victoria Street, Westminster, London, S.W.1. (Fee £5, returnable.)

Dublin, April 16—24 domestic-type boilers, cylinders, piping, etc., for the Town Council. The A.R.P Department, 43, Upper O'Connell Street, Dublin.

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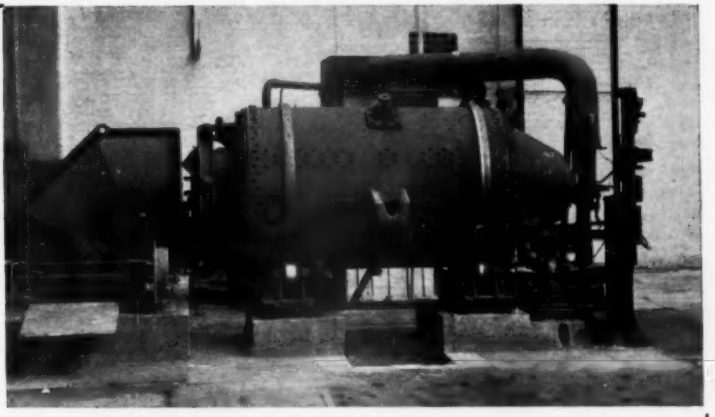

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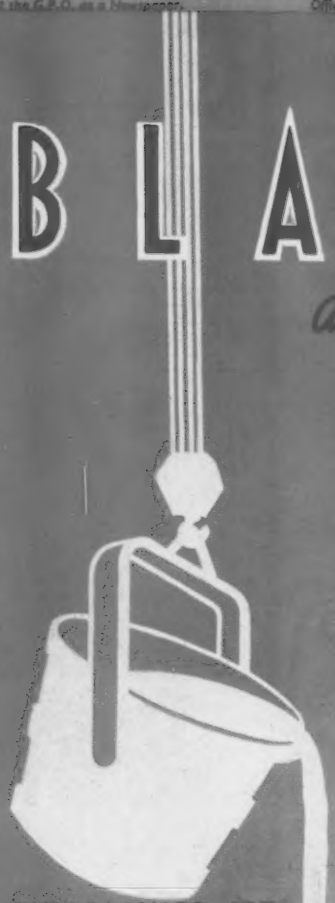

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